CH2MHILL

Documents Reviewed—20130503 RM 10 9 Final Design.docx

Supplement to Final Design Report - Overview of Numerical Modeling Supporting the Design of the Active Layer in the River Mile 10.9 Engineered Sediment Cap

Comment No. Word	Comment No. EPA	Location		Comment	Response
Comments on Long Term Monitoring Plan					
1	1	N/A	N/A	As we discussed, EPA has consulted with experts in the field of active cap design and monitoring to develop the broad outlines of what an implementable plan that provides good, usable data should look like. a. <u>Goal</u>: Determine if contaminants under the cap are migrating upwards, so as to monitor the long-term performance of the cap. b. <u>Approach</u>: Use vertical Solid-Phase Micro-Extraction (SPME) passive samplers to monitor pore water within the cap and at the sediment-surface water interface of the cap. The samplers should be extended through the cap, to at least 6 inches below the expected cap bottom. The fibers can be placed either discretely and/or over longer sections to monitor specific zones of the cap. c. <u>Design</u>: Our current recommendation does not require any modification to the existing cap design. A few weeks after placement of the cap is complete (to allow time for the cap to settle), tubes, or other appropriate devices to allow access to the sample matrix within the cap, can be installed through the cap by moving aside the armor layer and replacing it after installation. These devices can then be used to insert the SPME sampler, and thus can allow for long-term monitoring of the cap. For security purposes, the devices should include a locking mechanism. For the monitoring at the sediment-surface water interface, samples can be taken using the same SPME apparatus as described above, or with a separate configuration. Measurements should be taken, at a minimum, at the cap's interface with the existing sediment, at the top of the active layer and at the armor layer/surface water interface. d. <u>Other requirements</u>: Sediment samples must be collected prior to placement of the cap and then the top sand layer should be sampled during the monitoring period, concurrent with the pore water sampling. e. <u>Additional issues/questions to discuss</u>: i. The density and frequency of sampling needs to be determined. ii. Ambient water quality conditions of the sediment pore water and surface water will be well established by the end of the removal action. Pore water and sediment-surface water interface concentrations that are collected during the monitoring program can be compared to those ambient conditions to determine if there are changes such as increases which may indicate breakthrough, or decreases which may demonstrate that the cap is performing as expected. This is a performance-based monitoring plan.	Any long-term monitoring of the cap's chemical containment effectiveness should be part of an overall Lower Passaic River Long-Term Monitoring Plan (LTMP) that will be developed in conjunction with the overall remedy for the river. Recent EPA guidance on this subject ("Use of Amendments for In Situ Remediation at Superfund Sediment Sites", OSWER Directive 9200.2-128FS, April 2013) identifies a variety of monitoring methods without indicating that one is more effective than another. A majority of the proposed monitoring methods do not involve installation of samplers at all. Other CERCLA sites utilizing caps as a part of the remedy have developed and are implementing long-term monitoring plans that take a different approach to monitoring remedy performance than installing samplers within a cap. As noted in the comment, EPA's "…current recommendation does not require any modification to the existing cap design…" and samplers would be installed "…after placement of the cap is complete…" The RM 10.9 cap was designed to contain the extremely low concentrations associated with breakthrough of even the most mobile COPCs for at least 100 years with its actual performance expected to achieve no breakthrough for more than 250 years. Given the conservative nature of the cap design and the associated long timeframes prior to breakthrough, it is unnecessary to install chemical monitoring ports in the RM 10.9 cap prior developing a river-wide LTMP strategy. In addition, the CPG does not agree that EPA's proposed monitoring scheme is appropriate. Rather, it is likely to produce ambiguous and contradictory results in determining whether migration is occurring because of the very low levels of COPC's in the predicted breakthrough compared to significantly higher COPC concentrations that currently characterize the LPRSA water column. The CPG does not agree that post dredge sediment samples are necessary. More than 50 sediment samples were collected from the 1.5 to 2.5 ft interval during the RM 10.9 Characterization. This interval includes the dredge depth of 2 ft (including the dredge tolerance of +/- 4 inches). The post-dredge surface is well-characterized and additional sampling is not required.

Comments on Supplement to Final Design Report - Overview of Numerical Modeling Supporting the Design of the Active Layer in the River Mile 10.9 Engineered Sediment Cap

2	1	N/A	N/A	The CapSim model was run with DOM = 0. The design team should demonstrate that it makes no difference to the conclusions to allow for a higher (more realistic) concentration of DOM, i.e. that the amount of activated carbon specified is sufficient to strip the contaminant off of DOM before it can migrate out of the reactive cap. This may be the case, but it is not currently demonstrated, or otherwise accounted for. In addition, please provide clarification on the expectations/assumptions used for sorption kinetics of any DOM-associated organic contaminants as they are carried through the cap (presumably upward toward the surface water).	In his review of the RM 10.9 CapSim input and output files, Dr. Reible indicated that DOM should be set to zero for the organic COPCs since the concentrations were not obtained using partition sampling (e.g. PDMS, PE, or POM). Please note that mercury was run with DOM = 95 mg/L. Also, the initial CapSim model runs presented in the Pre-Design Report were conducted using DOM = 100 mg/L and estimated freely dissolved concentrations based on the EqP method. These results indicate that cap will be sufficiently protective for the concentrations of DOM measured in the field. With respect to assumptions used for sorption kinetics, McDonough et al. (2008) quantified the sequestration of PCBs by virgin activated carbon as well as DOM loaded activated carbon. For the RM 10.9 CapSim modeling, adsorption coefficients for DOM loaded activated carbon were used to consider the affect the presence of natural organic matter at the site. Additional studies were referenced that focused on the effect of natural organic matter on PCB adsorption onto activated carbon. The results indicate that the presence of natural organic matter may delay the equilibration time from 3 days for virgin activated carbon to about 30 days for DOM preloaded activated carbon (Sharma et al., 2009). The duration of the adsorption study conducted by McDonough et al. (2008) was 28 days which is reasonable time frame as compared to the RM 10.9 average and maximum flux conditions for a 60 cm thick cap as evaluated in the cap model. At average flux conditions (307 cm/yr or 0.84 cm/d) it would take about 70 days to pass through the cap and at maximum flux conditions (934 cm/yr or 2.56 cm/d) it may take about 20 days. References: McDonough, et al. (2008). Water Research, 42, 575-584. Sharma, et al. (2009). Environmental Engineering Science, 26, 1371-1379.
3	2	N/A	N/A	The design includes the use of AquaGate, a proprietary product that appears to consist of an aggregate core, bentonite, and activated carbon (at least as one variant of the product). There is little information available on the supplier's website about the composition of AquaGate or its demonstrated performance in applications like the one proposed – such as how readily it mixes with sand, its effectiveness in sequestering contaminants, its permeability, etc. Please provide some additional information and a couple of case studies to help answer these questions.	Please refer to the attached supplemental materials provided by the AquaGate vendor.

4	3	N/A	N/A	Please compare the measured in-situ seepage velocity against a seepage velocity calculated using a laboratory hydraulic conductivity and assumed gradient, to assess any tidal effects.	The in-situ seepage velocity measurements directly incorporate the tidal effects without requiring the use of laboratory-derived hydraulic conductivities and assumed gradients. The seepage data are empirical in-field measurements collected under tidal conditions and do not require additional manipulation with an assumed gradient and laboratory-derived hydraulic conductivities.
Comments on Supplement to Final Design Report - Overview of Numerical Modeling Supporting the Design of the Active Layer in the River Mile 10.9 Engineered Sediment Cap					
5	4			As a point of clarification, based on sediment characterization data, the NJDEP team determined that the pore water collection method utilized would yield "representative" pore water data, not necessarily biased high, as represented in the cap design supplemental technical memorandum dated May 9, 2013. The pore water samples were comprised of composites from across the mudflat, with collection points selectively chosen based on the higher sediment levels for the COPCs at the target depth of 2 – 4 ft., to represent the new surface to be directly beneath the cap. However, widespread elevated contaminant concentrations exist at that depth.	Sediment sampled for pore water extraction were selectively chosen based on the higher sediment concentrations for the COPCs at the target depth, and are by definition, biased high. Moreover, the method by which the hydrophobic organic compounds (e.g., 2,3,7,8-TCDD, PCBs, and phenanthrene) were obtained from the RM 10.9 sediments(i.e., unfiltered concentrations from pore water generated by centrifugation) will likely lead to overestimates of pore water concentrations. As discussed in the June 2, 2013 Technical Memorandum provided by Dr. Reible, unfiltered samples are expected to contain more contaminants bound to colloids and natural organic matter than are likely to migrate through the sand layer in the cap. In addition, the processing of sediment to generate pore water also tends to increase the colloidal material and contaminant concentration in the generated pore water compared to passive sampling techniques. These issues lead to likely overestimating of the pore water concentrations migrating into and through the cap.
6	5			Clarification is needed on the stability of the capped region relative to the adjacent river channel to ensure there is not excessive pressure for side-slope failure along the full vertical face of the western boundary of the removal area. (Section 4.2 appears to address upper side slope stability for the top several feet of the mudflat where dredging will take place.	After the cap has been placed, there will be no significant difference in elevation before and after the removal action. The capped surface will be at relatively the same elevation as the channel. There will not be any "excessive pressures" on the cap system.
7	6			We had previously discussed placing sand over the northern extension of the removal area, where capping will not take place, but this is not included in the design plans. Please address. In addition, consider placement of sand over the no-dredge zone, if possible.	As stated in the last paragraph in Section 4.2.1, "The area north of Station 32+00 will be dredged to native material (based on boring logs) because the relatively steep slope here will not support cap material." The placement of sand in this area will serve no purpose as it will collapse and/or be carried downstream during storms. In addition, as has been noted in previous Response-to-Comment documents, CPG has agreed to sample the underlying native material in the northern extension after the sediment has been removed to determine post-dredge sediment concentrations. Placing sand in the no-dredge zone would elevate that section of the mudflat, and NJDEP has already mandated that there can be no increase in mudflat bathymetry.
Comments on Section 7 of the Final Design Report					

8	7	Section 7.2.2, Chemical Containment	The documents states that to create more favorable conditions for adsorption and isolation of COPCs, activated carbon will be mixed with sand rather than being placed as a separate layer. Please provide more information to support this statement.	Results of CapSim model runs comparing cap performance with the active material and sand as separate layers and with a mixed sand/active layer show better performance when the active material and sand are mixed. This type of performance advantage for mixed active material and sand has been confirmed in discussions with both Drs. Reible and Ghosh.
9	8	Section 7.2.3, Cap Armoring	This section states that, at EPA's request, the impact of a more intense (500-year) storm event was evaluated. However, the outcome of that evaluation is not presented. This information should be included in this section, along with any resulting changes in design that this information may have prompted. The design documents should describe the thickness of the cover sand over the armor layer, its intended purpose (flood control, habitat re-establishment, etc.) and how the designated thickness meets these goals.	The last paragraph in 7.2.3.1 Preliminary Armor Layer Sizing provides the requested information as follows: "If a 500-year return period storm were to be used to design the cap, the minimum D50 for Armor Stone Types A and B would be 7 in. and 4 in., respectively. The calculated minimum thicknesses of the Armor Stone Types A and B layers would be 16 in. and 9 in., respectively. The corresponding average cap thicknesses would be specified as 18 in. and 12 in., respectively." There were no changes in the design as a result of this evaluation. The RM 10.9 cap will be monitored for physical integrity. If a storm erodes the cap's armor layer, it will be detected and repaired. The text will be clarified to note that only enough thickness of sand cover is being added to cover the armor layer's stones. The intended purpose is to provide a smooth surface to not exacerbate flooding and to enhance habitat re-establishment.
10	9	Figure 7-5	Figure 7-5 depicts smooth stone in the armored layer. Please clarify if angular or smooth stone is to be used and the reasons selected.	Figure 7-5 is not meant to be draw-to-scale representation of the size, shape, and gradation of the cap materials. The armor layer consists of angular, not rounded, stone. Angular stone was utilized in the design as it is more resistant to being displaced by river flows than smooth stone.
11	10	Section 7.8.1, top of page 7-11	This section discusses a Reactive Core Mat, SediMite and AquaGate. The selected product should be specified.	All references to Reactive Core Mat and SediMite will be deleted from the text.